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- Graphing
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MP2

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- Cellular Respiration
- Food Chain
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- Food Webs
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MP3

- Ecology Nowicki Ch. 14
- Properties of Water
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- Toil for Oil
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Energy Review

Define the following types of energy:

Kinetic Energy: Energy of movement
or motion

Thermal Energy:
Heat

Light Energy:
Light

Electrical Energy:
Energy of electricity

Gravitational Potential Energy (GPE): Something at a
height with the potential to fall.

Chemical Potential Energy (CPE): Energy stored in
chemical bonds. Examples: food, batteries

Sound Energy:
Energy of sound and vibrations

1) What do we mean if we say something is 100% efficient?

All energy is being used for the purpose.

2) What type of energy do you typically get any time there is an energy transfer
(think about what happens to appliances when you use them too long)?

Thermal/Heat.

3) What is the main source of light energy on Earth?

The sun

4) What types of energy are present if you have wind blowing a windmill to turn a turbine, which is attached to a light bulb, which gets lit?

Kinetic \rightarrow Electrical \rightarrow Light
 \rightarrow Heat \rightarrow Heat

5) What types of energy are present when plants use sunlight to undergo photosynthesis to produce glucose?

Light \rightarrow CPE
 \rightarrow Heat

6) An object is dropped from a building. As it falls CPE is transferred into Kinetic energy.

7) When you use an iPod, CPE from the batteries is used to generate electrical energy in order to get sound energy from your headphones.

Define the following. - See page 1.

Kinetic Energy

Gravitational Potential Energy

Heat

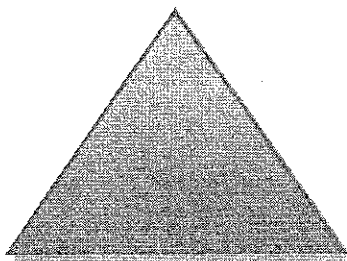
Chemical Energy

ATP Human Energy
(Adenosine triphosphate)

Light energy

Electrical Energy

Explain what is meant by the Trophic Pyramid. What did it have to do with the predator/prey lab?



Name _____

Per _____ Date _____

Photosynthesis is the process a plant does to make food for itself using energy from sun light.

Chemical Formulas

Photosynthesis

Names:

Sunlight + Water + Carbon Dioxide \rightarrow Glucose + Oxygen

Symbols:

Sunlight + H_2O + $6CO_2$ \rightarrow $C_6H_{12}O_6$ + $6O_2$

Cellular Respiration is the process plants and animals do to release energy from food

Chemical Formulas

Cellular Respiration

Names:

Glucose + Oxygen \rightarrow Water + Carbon Dioxide + ATP

Symbols:

$C_6H_{12}O_6$ + $6O_2$ \rightarrow $6H_2O$ + $6CO_2$ + ATP

Energy changes for **Photosynthesis and Cellular Respiration**



Explain how the law of conservation of energy applies to Photosynthesis.

↓
Energy can not be created or destroyed, only transferred.

Energy is transferred from the sun to the plant. It is stored as CPE in glucose then released as ATP.

Explain how the law of conservation of energy applies to Cellular Respiration

The CPE stored in glucose is released by cellular respiration as ATP. The energy is transferred, not created or destroyed.

What is meant by the statement "Cellular Respiration is the opposite of Photosynthesis."

CR's outputs are Photo's inputs.

Photo's outputs are CR's inputs.

What is ATP?

Human Energy: Adenosine triphosphate

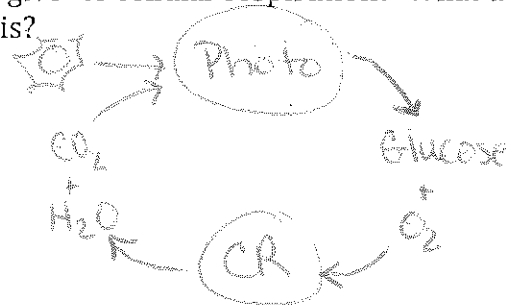
Fill in the blanks.

The part of the plant cell that does photosynthesis is called the chloroplast.

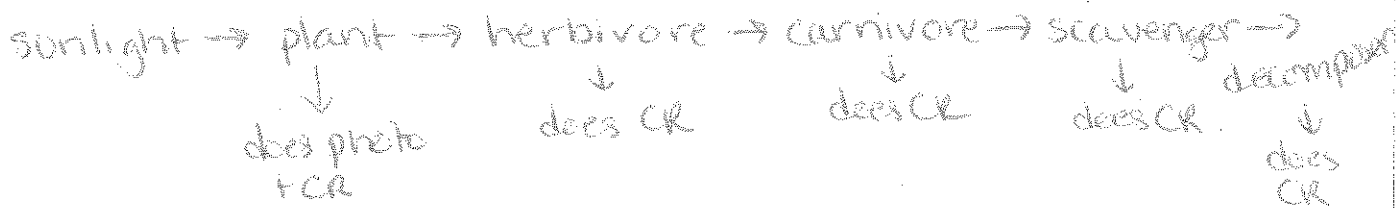
The part of the plant cell that does cellular respiration is called the mitochondria.

The part of the animal cell that does cellular respiration is called the mitochondria.

How do Photosynthesis and Cellular Respiration act as a cycle? What does photosynthesis "give" to cellular respiration? What does cellular respiration "give" to photosynthesis?



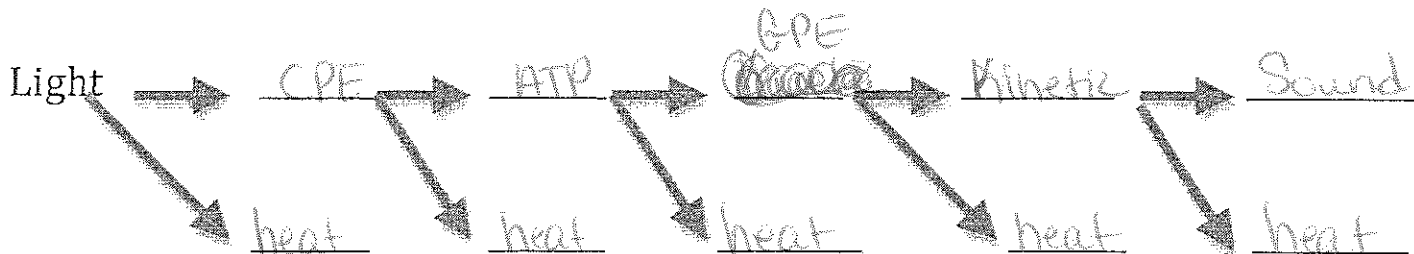
What are the steps of the food chain? Give an example. How do Photosynthesis and Cellular respiration fit into the food chain?



Why are photosynthesis and cellular respiration important to your life?

Plants make glucose/food from energy from sunlight providing food that I need for energy. I do CR to release the energy from my food.

Track the flow of energy from (Sun) Light all the way to you picking up and dropping a glass bottle into a recycle bin. Be sure to include all energy transfers all the way from the sun's energy until the bottle lands in the recycle bin. Think about how the sun's energy gets to you through your diet (complete with fruits and vegetables) and how you would give the energy to the bottle.



Remediation Lab One

Name:

Date:

A student did an experiment at home where she added different amount of liquid fertilizer to plants to see the effect on plant growth. All of the plants had soil in the containers. Liquid fertilizer is used to make the plants grow faster. She gave all the plants the same amount of water and light, and let them all grow for a month. She recorded the heights after one month of growth. Below is the data that the student collected.

Amount of Fertilizer (ml)	Plant height (cm)
.5ml	3cm
1 ml	3.4 cm
1.5 ml	4.2 cm
2 ml	4.7 cm
2.5 ml	5.3 cm
3 ml	6 cm
3.5 ml	6.5 cm

1. (0.1P/HP)

What is the independent variable?
Why?

Amount of fertilizer because
I control it.

What is the dependent variable?
Why?

The plant's height because it relies on
the amount of fertilizer.

2. (0.2P/HP) Make a proper graph of the data

3. (0.3 P) Think about it, should you start your line at (0,0), please explain.

4. (0.3P) What is the slope of the line on your graph?

see graph

5. (0.3P) What does the slope mean according to this data?

For every 1 ml of fertilizer, the plant grows
1.33 cm.

6. (0.3HP) What would the plants height be if the student used 4.5 ml of fertilizer?

6.5 cm
+ 1.33 cm
7.83 cm

7. (0.4P/HP) What is the relationship between the amount of fertilizer and the height of the plant? Use multiple forms of data to support the relationship.

As the amount of fertilizer increases, the height of the plant increases. When 1ml of fertilizer is applied the plant was 3.4cm. At 3ml, the plant is 6cm tall.

8. (1.1P) What are the energy transfers from the sun to the plant?

light \rightarrow CPE
 \rightarrow heat

9. (1.1P) What if she ate the plant, what would the energy transfers be then?

light \rightarrow CPE \rightarrow ATP
 \rightarrow heat \rightarrow heat

10. (1.2P) What is the law of conservation of energy, and how does it apply to the energy transfers you discussed in question 8?

Energy can not be created or destroyed, only transferred.

11. (2.1P) How does the plant get its energy from the sun? (Discuss all of the inputs and outputs).

light + water + $\text{CO}_2 \rightarrow$ glucose + oxygen

Energy is transferred from the sunlight to the plant. The plant takes in light, H_2O , CO_2 to make

12. (2.2P) How would the girl get energy from the plant if she ate it? (Discuss all inputs and outputs)

The girl does cellular respiration to release ATP from the glucose.

13. (2.3P) What are the similarities/connections between your answers for question 11 and 12?

CR and Photo are opposites

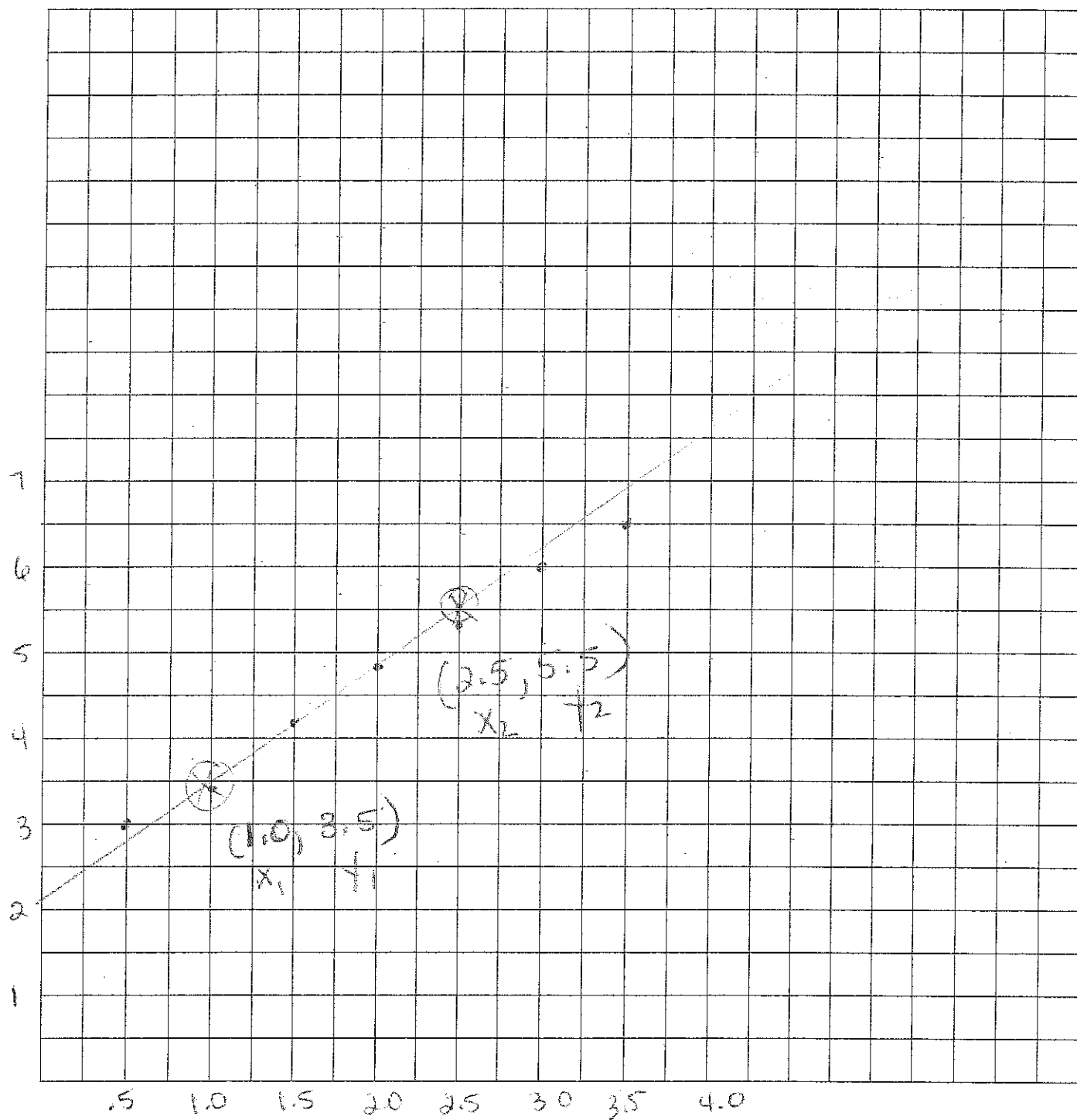
Name _____

Date _____

Period _____

Make Graph here if you messed up on the first one.

Fertilizer v Plant Height



$$\text{slope} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{5.5 - 3.5}{2.5 - 1.0}$$

$$= \frac{2.0}{1.5}$$

Amount of Fertilizer
(ml)

$$\frac{2.0}{1.5} = 1.33 \text{ cm/ml}$$

Community Interactions and Niche Review

Match the scenario with the correct community interaction. Words may be used more than once.

WORD BANK

Predation	Competition	Mutualism
Parasitism	Commensalism	

1. Predation A lizard is going around eating insects.
2. Mutualism A bird eats the scraps left inside an alligator's mouth. This cleans the alligator's teeth.
3. Competition Two male wolves are fighting in order to become the leader of the pack.
4. Commensalism Bacteria live on the skin of mammals. They have no affect on the mammals.
5. Competition A squirrel and a bird are trying to get the same nuts from a tree.
6. Parasitism Worms are living in the muscles of a pig and slowly killing the pig.
7. Predation An owl kills and eats a shrew.
8. Mutualism Trees provide humans with oxygen. Humans provide trees with carbon dioxide.

Answers the following questions.

1. Two different species of frogs are competing for the same limited resources. According to the principle of **competitive exclusion**, what are the three possible outcomes of this scenario?

① One species will die, the other survives.

② Co-exist

③ One species moves

2. There are two different species of birds. One lives in North America. The other lives in Australia. They eat similar foods, have similar behavior, and play similar roles in their respective habitats. Explain why these two species of birds could be considered **ecological equivalents**.

These species have the same niche but dwell in different ecological geographical regions.

3. Chose one of the three types of symbiosis. Identify the type that you pick. Give an example of this type. Explain why this example fits into this type.

Answer Answers will vary.

The 3 types: Mutualism, Commensalism and Parasitism

Answer Key

Food Chain and Food Web Practice

1. In an ecosystem there is grass, squirrels, owls, and wolves. Assume that squirrels eat the grass, owls eat the squirrels, and wolves eat the owls.

a) Design a food chain for the above scenario.

Grass → Squirrels → Owls → Wolves

b) For each trophic level, identify the organism in this food chain

Producer: Grass

Primary Consumer: Squirrels

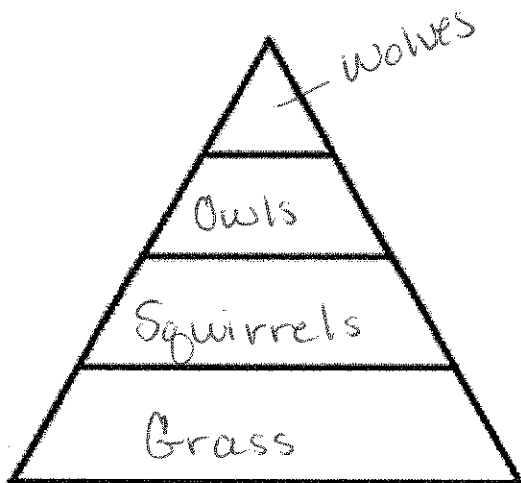
Secondary Consumer: Owls

Tertiary Consumer: Wolves

c) There are mushrooms as part of this food chain that turned any dead organism into nutrients to put back into the soil. What trophic level would we consider the mushrooms to be?

Decomposers

d) Fill in the energy pyramid for the food chain in this scenario.



2. The following organisms are part of an ecosystem: mushrooms, bacteria, grass, shrubs, mice, squirrels, rabbits, snakes, hawks, owls, wolves, and foxes.

Mushrooms and bacteria break down dead organisms in order to put nutrients back into the soil.

Mice eat grass.

Squirrels and rabbits eat grass and shrubs.

Snakes eat mice and squirrels.

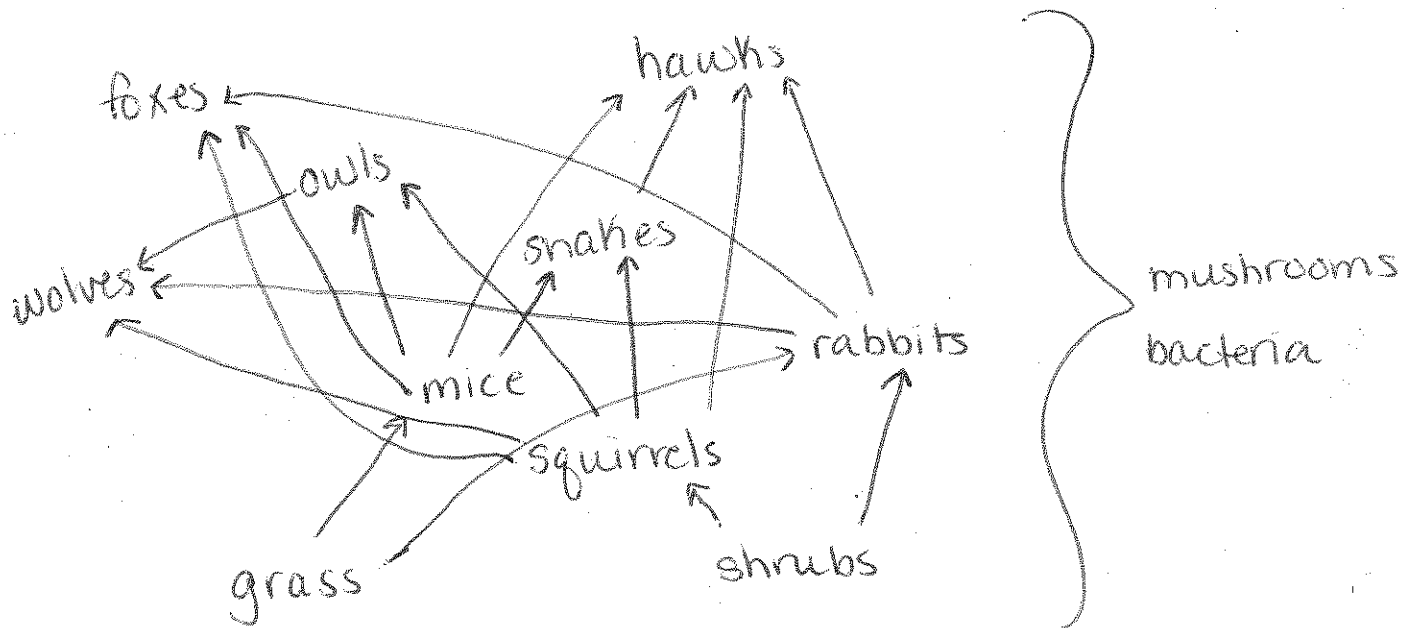
Owls eat mice and squirrels.

Hawks eat snakes, mice, squirrels, and rabbits.

Foxes eat rabbits, squirrels, and mice.

Wolves eat rabbits, squirrels, and owls.

a) Design a food web for the above scenario



b) For each trophic level, identify the organism in this food chain

Producer: grass, shrubs

Primary Consumer: mice, squirrel, rabbits

Secondary Consumer: snakes, foxes, hawks, owls

Tertiary Consumer: hawks, wolves

Decomposers: mushrooms, bacteria

Answer Key

Ecology Review Questions

1. What are all of the biotic and abiotic factors in an area where an organism lives?
Ecosystem / Habitat
2. What is the food, abiotic conditions, behavior, and the role an organism plays within an ecosystem?
Niche
3. They can share, one can die, and one can find other resources are the three outcomes for what principle?
Competitive Exclusion
4. Two frogs that have the same niche but live in different locations is an example of what?
Ecological Equivalents
5. When a weaker bird finds the same resources in a less desirable location, this is an example of what?
Niche Partitioning
6. An example of this is when a bee gets food from a flower while the bee pollinates the flower.
Mutualism
7. An example of this is when mites live in the eyelashes of humans, but do not affect the humans.
Commensalism
8. An example of this is when a lion kills a zebra and eats it.
Predation
9. An example of this is when a group of elephants and a group of hippos are fighting for the same water supply.
Competition
10. An example of this is a tape worm living inside a cow's stomach, making the cow sick over time.
Parasitism
11. What is the population density of a group of 600 turtles living in an area of 300 square miles?
2 turtles/mi²
12. What does a population density of 4 deer/square acre mean?
There are 4 deer for approximately every square acre.
13. What is the type of population dispersion when the population is in a neat organized pattern?
Uniform

14. What is the type of population dispersion when there is a school of fish grouped together in one area?

Clumped

15. Name an organism that follows a type 1 survivorship curve with a low infant mortality rate and a small rate of death until old age.

Humans (most mammals)

16. What are the four factors that affect a population's size?

Immigration, Emigration, Birth, Death

17. What type of population growth is caused by an abundance of resources?

Exponential

18. What type of growth is affected by the carrying capacity of the environment?

Logistic

19. What is a dramatic decline in a population over a short period of time?

Population Crash

20. Name some limiting factors.

Weather, Competition, Human Activities, Nat. Disasters

21. What is the first organism to live in an area that used to be uninhabited?

Pioneer Species examples: lichen, moss

22. What is the type of succession that occurs in a previously uninhabited area?

Primary Succession

23. Name an organism that could be found in the first step of primary succession.

Lichen, Moss

24. Name an event that can start primary succession

Volcano, Glacier

25. Name an event that can start secondary succession.

Fire, Tornado

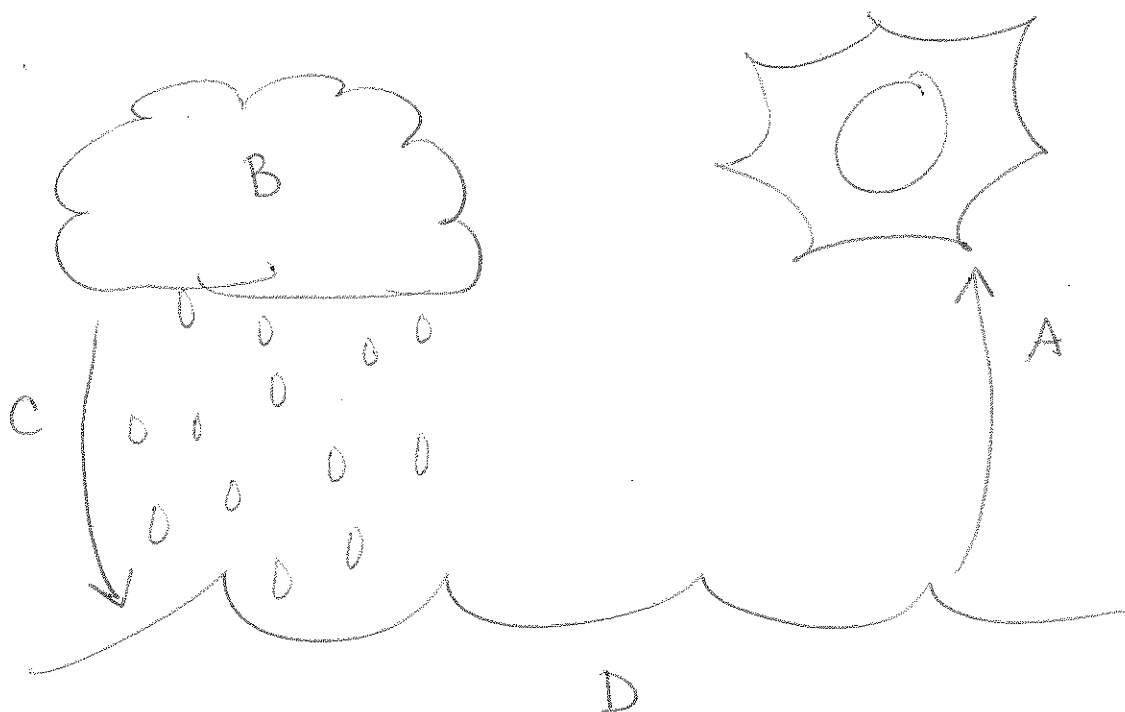
Answer Key

Water Cycle

Explain the following parts of the water cycle:

- A. **Evaporation** When the sun heats up water and turns it into vapor or steam which goes into the air. (liquid \rightarrow vapor)
- B. **Condensation** Water vapor in the air gets cold and changes back into liquid forming clouds. (vapor \rightarrow liquid)
- C. **Precipitation** When so much water has condensed that clouds get heavy and water falls back to earth: Rain, hail or snow
- D. **Collection** When water falls back to earth, it gathers or collects in oceans, rivers, streams and the ground.

Draw a picture showing all these steps in the water cycle:



1) What is another name for the water cycle?

Hydrological

2) What happens when clouds collect too much water?

Precipitation

3) What is needed to form clouds besides water vapor?

Dirt or dust

4) What are some different types of precipitation?

Snow, rain, hail

5) What are some different things that will collect water after it falls from the sky?

Pond, lake, ocean, river, soil

6) What are some ways the water cycle is important to life on Earth? Explain.

Answer Key

Nitrogen Cycle

1) Why is nitrogen gas in the atmosphere not usable for plants and animals?

It is not reactive.

2) What are the three ways nitrogen can be fixed to change it from nitrogen gas into usable nitrogen compounds?

- Lightning
- Bacteria in the soil
- Plants with root nodules (beans, clover)

3) Why is nitrogen important to life?

DNA

Amino acids

Proteins

4) What type of organism is responsible for most of the nitrogen fixation?

Bacteria

5) How does nitrogen get back into the air after plants and animals use it?

Bacteria in the soil will decompose the dead matter and release nitrogen back into the air.

6) Draw the nitrogen cycle

7) Starting with nitrogen gas with the air, explain how nitrogen would go through the nitrogen cycle and end up back in the air. (There is more than one possible path for this)

Answer key

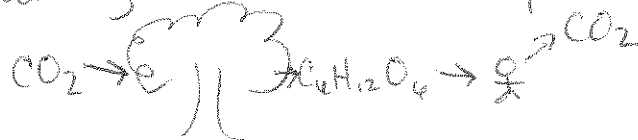
Carbon Cycle

1) Why is carbon considered the building block of life?

It is in all living things.

2) Explain the role that photosynthesis and respiration play in the carbon cycle.
Draw a diagram.

Plants take in CO_2 during photosynthesis to make glucose (which ~~stores~~^{contains} C). Animals eat the glucose and then release CO_2 during cellular respiration.



3) - What are areas that store carbon over long periods of time? Give two examples.

Ocean

Trees

4) What is the carbon compound that occurs naturally in the air?

Carbon dioxide
(CO_2)

- 5) What organisms play an important role in the breakdown of dead carbon-based material and the creation of fossil fuels?

Bacteria

- 6) Why does burning fossil fuels put extra carbon compounds into the environment?

There is a lot of carbon in fossil fuels. When they are burned, CO_2 is released into the atmosphere.

- 7) What are the three main types of fossil fuels? What do we use fossil fuels for?

Oil

Coal

Natural Gas

Transportation

To generate electricity

Heating

- 8) What are two ways we can help to limit the amount of extra carbon that gets put into the environment? Explain.

Use more renewable sources
(solar, wind, hydro)

Use less energy
(ride a bike/walk, turn off the lights)

- 9) Starting with carbon in the atmosphere, trace the path of a carbon molecule through the carbon cycle. (There is more than one possible path)

MID-UNIT 3 TEST*

Name _____

PECO is the company that supplies our houses with electricity. Typically, they are using coal to generate electricity to power our homes.

- 1) Explain the process that PECO uses to generate electricity from coal.

First, coal is burned to release heat.

Next, the heat is used to turn water into vapor / steam.

Finally, the vapor will be used to turn a turbine which generates electricity.

- 2) Is this process 100% efficient in making electricity? Circle the correct answer.

- a) Yes, it is 100% efficient. All of the energy is used to generate electricity.
- b) Yes, it is 100% efficient. All of the energy is used to generate heat.
- ☒ c) No, it is not 100% efficient. Some of the energy is wasted as heat instead of being used to generate electricity.
- d) No, it is not 100% efficient. All of the energy is wasted as heat.

- 3) Below is a list of energy sources. Circle the three non-renewable resources that PECO could use instead of coal.

Hydroelectric

Natural Gas

Solar

Biomass

Nuclear

Wind

Geothermal

Oil

- 5) What organisms play an important role in the breakdown of dead carbon-based material and the creation of fossil fuels?

bacteria

- 6) Why does burning fossil fuels put extra carbon compounds into the environment?

Carbon is stored in fossil fuels and released as CO_2 when they are burned.

- 7) What are the three main types of fossil fuels? What do we use fossil fuels for?

Oil

- Generating electricity

Coal

- Heating

Natural Gas

- Transportation

- 8) What are two ways we can help to limit the amount of extra carbon that gets put into the environment? Explain.

- Use less energy

- Use more renewable energy sources and less nonrenewable energy sources.

- 9) Starting with carbon in the atmosphere, trace the path of a carbon molecule through the carbon cycle. (There is more than one possible path)

7) In the future, is coal is not going to be a good source for providing electricity.
Name two reasons why.

1) It is nonrenewable

2) It pollutes our environment

8) Instead of using coal and other non-renewable energy sources we can use renewable energy source. Provide three examples.

1) Wind

2) Solar

3) Geothermal

9) Pick one of these renewable sources and explain how it is used to generate electricity.

Various

10) Using the energy source you picked in question 9, give two pros and two cons for using this energy source.

Various

